L Number	Hits	Search Text	DB	Time stamp
-	1758	324/754.ccls.	USPAT; US-PGPUB	2003/06/24 15:49
-	1	microstylet and tube	USPAT; US-PGPUB	2003/03/21 18:02
-	1	microstylet and tube	USPAT; US-PGPUB	2003/03/21 18:02
-	1	microstylet	USPAT; US-PGPUB	2003/03/21 18:04
-	2	acerate and carbon and diamond	USPAT; US-PGPUB	2003/03/21 18:04
-	0	microstylet	EPO; JPO; DERWENT; IBM_TDB	2003/03/21 18:05
-	2744	probe and (diamond and carbon)	USPAT; US-PGPUB	2003/03/21 18:07
-	2032	probe and (diamond and carbon and metal)	USPAT; US-PGPUB	2003/04/08 17:34
-	1021	carbon adj nanotube	USPAT; US-PGPUB	2003/03/21 18:15
-	172	menstruum	USPAT; US-PGPUB	2003/03/21 18:17
-	1	acerate and menstruum	USPAT; US-PGPUB	2003/03/21 18:17
-	4	menstruum and probe	USPAT; US-PGPUB	2003/03/21 18:17
-	24	acerate	USPAT; US-PGPUB	2003/03/21 18:17
-	0	(method adj manufacruring with probe and tube and carbon).clm.	USPAT; US-PGPUB	2003/04/08 17:31
-	39	probe and (diamond and carbon)	EPO; JPO; DERWENT; IBM_TDB	2003/04/08 17:31
-	2	(method adj manufacturing with probe and tube and carbon).clm.	USPAT; US-PGPUB	2003/04/08 17:33
-	2	(method with manufacturing with probe and tube and carbon).clm.	USPAT; US-PGPUB	2003/04/08 17:34
-	1467	probe and (diamond and carbon and tube)	USPAT; US-PGPUB	2003/04/08 17:34
-	1808	probe and (diamond and carbon and glass)	USPAT; US-PGPUB	2003/04/08 17:34
-	1015	probe and (diamond and carbon and tube and glass)	USPAT; US-PGPUB	2003/04/08 17:35
-	224	probe and (diamond and carbon and tube and glass and filling)	USPAT; US-PGPUB	2003/04/08 17:35
-	178	probe and (diamond and carbon and tube and glass and filling and drawing)	USPAT; US-PGPUB	2003/04/08 17:37
-	62	probe and (diamond and carbon and tube and glass and filling and drawing and etch$)	USPAT; US-PGPUB	2003/04/08 17:37
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-	0	29.ccls. and tube and probe and diamond	EPO; JPO; DERWENT; IBM_TDB	2003/06/24 13:32
-	0	174.ccls. and tube and probe and diamond	EPO; JPO; DERWENT; IBM_TDB	2003/06/24 13:33
-	0	174.ccls. and tube and probe and diamond	USPAT; US-PGPUB	2003/06/24 13:33
-	703	probe and (diamond same carbon)	USPAT; US-PGPUB	2003/06/24 13:34
-	10	probe and carbon adj whisker	USPAT; US-PGPUB	2003/06/24 13:55
-	661	carbon adj nanotube	USPAT; US-PGPUB	2003/06/24 13:55
-	205	(carbon adj nanotube) and probe	USPAT; US-PGPUB	2003/06/24 13:56

-		99	((carbon adj nanotube) and probe) and glass	USPAT; US-PGPUB	2003/06/24 13:56
-		7	((carbon adj nanotube) and probe) and glass adj tube	USPAT; US-PGPUB	2003/06/24 14:04
-		18	(carbon adj nanotube) and glass adj tube	USPAT; US-PGPUB	2003/06/24 14:48
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-		16	((carbon adj nanotube) and glass adj tube) and (micro$12 field)	USPAT; US-PGPUB	2003/06/24 14:50
-		11	((carbon adj nanotube) and glass adj tube) and (micro$12 emitter)	USPAT; US-PGPUB	2003/06/24 15:06
-		11	((carbon adj nanotube) and glass adj tube) and (micro$12 (field adj emitter))	USPAT; US-PGPUB	2003/06/24 14:50
-		6	((carbon adj nanotube) and glass adj tube) and field adj emitter	USPAT; US-PGPUB	2003/06/24 14:50
-		1	"20030042922"	USPAT; US-PGPUB	2003/06/24 14:58
-		14	((carbon adj nanotube) and glass adj tube) and micro$12	USPAT; US-PGPUB	2003/06/24 15:06
-		2	((("6020747") or ("5457343") or ("5218757") or ("5532613") or ("5596283")).PN.) and glass adj tube	USPAT; US-PGPUB	2003/06/24 15:50
-		5	(("6020747") or ("5457343") or ("5218757") or ("5532613") or ("5596283")).PN.	USPAT; US-PGPUB	2003/06/24 17:00
-		0	((("6020747") or ("5457343") or ("5218757") or ("5532613") or ("5596283")).PN.) and fastigiate	USPAT; US-PGPUB	2003/06/24 17:00

US Patent No. - PN (1):
5218757

Detailed Description Text - DETX (38):
The thick end of the resulting tapered carbon thin rod was electrically connected with a lead wire by using a silver paste cement and the whole surface was coated with a 15% solution of a glass resin (GR - 100, trade name, manufactured by Showa Denko K.K.) in ethanol, and dried to form an insulating coat. The member thus coated was inserted into a capillary tube of Pyrex glass (0.5 mm in inner diameter, 1 mm in outer diameter) and both ends of the glass tube were fixed to pulling terminals of a puller.

Detailed Description Text - DETX (39):
The center portion (5 mm long) of the glass tube was heated to plasticize said portion, and the puller was actuated at a stroke to bring the glass tube wall into close contact with the tapered carbon thin rod. Finally the central portion of the glass tube was cut to expose the carbon surface from the insulating coat resulting in completion of a tapered carbon microelectrode.

Detailed Description Text - DETX (49):
The thick end of the resulting tapered carbon thin rod was electrically connected with a lead wire by using a silver paste cement. The resulting member was inserted into a capillary tube of Pyrex glass (0.5 mm in inner diameter, 1 mm in outer diameter) and both ends of the glass tube were fixed to pulling terminals of a puller.

Detailed Description Text - DETX (50):
The center portion (5 mm long) of the glass tube was heated to plasticize said portion, and the puller was actuated at a stroke to bring the glass tube wall into close contact with the tapered carbon thin rod. Finally, the central portion of the glass tube was cut to expose the carbon surface from the insulating coat resulting in completion of a tapered carbon microelectrode.

KWIC

	U	I	Document ID	Issue Date	Pages	Title
1	☑	☑	US 6020747 A	20000201	11	Electrical contact probe
2	☐	☐	US 5218757 A	19930615	9	Tapered carbon microelectrode and thereof

US005218757A

United States Patent [19]

Kaneko et al.

[11] Patent Number: 5,218,757

[45] Date of Patent: Jun. 15, 1993

[54] TAPERED CARBON MICROELECTRODE AND PROCESS FOR PRODUCTION THEREOF

[75] Inventors: Hiroko Kaneko; Masahiro Yamada; Yukifumi Shigematsu; Wataru Mizutani, all of Ibaraki; Akira Negishi, Chiba; Takamasa Kawakubo; Yoshihisa Suda, both of Gunma, all of Japan

[73] Assignees: Agency of Industrial Science and Technology; Mitsubishi Pencil Kabushiki Kaisha, both of Tokyo, Japan

[21] Appl. No.: 722,545

[22] Filed: Jun. 25, 1991

[30] Foreign Application Priority Data

Jul. 16, 1990 [JP] Japan 2-185250

[51] Int. Cl.⁵ G01N 27/26

[52] U.S. Cl. 29/855; 29/825; 29/854; 29/885; 264/29.6; 264/29.5; 264/29.1; 204/416

[58] Field of Search 264/29.6, 29.5, 29.1; 29/885, 825; 204/416

[56] References Cited

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5,110,516	5/1992	Yoshida	264/29.6

Primary Examiner—John Niebling
Assistant Examiner—Bruce F. Bell
Attorney, Agent, or Firm—Darby & Darby

[57] ABSTRACT

A tapered carbon microelectrode is produced by extruding an organic material or a composition composed of crystalline carbon fine powder and an organic binder into a thin rod form, carbonizing said rod by calcining to produce a pure carbon thin rod, soaking the resulting thin rod as an anode in an electrolytic solution, gradually pulling up the thin rod while electrochemically oxidizing the tip portion of the thin rod. Then a lead wire is connected with the thick portion of the thin rod followed by coating all the surface except the conically sharp tip portion.

The tapered carbon electrode can be used for various electrochemical measurements and scanning tunneling microscope.

4 Claims, 2 Drawing Sheets

09/941085

EAST Browser - L1: (14) ((carbon adj ... | US 6573643 | Tag: S | Doc: 9/14 | Full: 1/3 | Total images: 9)

File Edit View Tools Window Help

SP.sup.3
micro -crystallites on the surface of the cathode 10 is sufficiently high, then
emission from the SP.sup.3 micro -crystallites will be sufficient to excite the
anode (not shown), without having to raise voltage levels to a magnitude sufficient for emission to occur from the SP.sup.2 micro -crystallites. Accordingly, by controlling pressure, temperature and method of deposition of

the amorphic diamond film in a manner which is well-known in the art, SP.sup.3
micro -crystallites can be made a large enough percentage of the total number of
micro -crystallites to produce sufficient electron emission.

Detailed Description Text - DETX (17):
Coating 62 may also be a carbon film deposited using chemical vapor deposition, and other techniques of an equivalent nature, such as disclosed in
U.S. patent application Ser. No. 08/859,960 and U.S. patent application Ser.
No. 08/910,604, which are hereby incorporated by reference herein. Such a carbon film may comprise several different types of structures, including carbon flakes as disclosed in U.S. patent application Ser. No. 07/642,955 or
carbon nanotubes such as disclosed in U.S. patent application Ser. No. 09/356,145 and 60/185,222, which are hereby incorporated by reference herein.

Detailed Description Text - DETX (18):
Turning now to FIG. 7, shown is one application of the wire 61 in which the
coated wire 61 functions as a conductive filament and is surrounded by a glass
tube 72, functioning as an anode and which has an electrical contact 73 to thereby produce a fluorescent tube. The tube functions in a manner which is analogous to the flat panel display application discussed in connection with FIGS. 1-5, that is, a potential difference is impressed between the wire 61 (negative) and the tube 72 sufficient to overcome the space-charge between the
cathode wire 61 and the tube anode 72. Once the space-charge has been overcome, electrons will flow from emission site SP.sup.3 micro -crystallites in
the coating 62.

Details | Text | Image | HTML | KWIC

	Document ID	Kind Codes	Source	Issue Date	Pages	
8	US 20020034757 A		US-PGPUB	20020321	140	Singl
9	US 6573643 B1		USPAT	20030603	9	Field
10	US 6448412 B1		USPAT	20020910	43	Metho
11	US 6399785 B1		USPAT	20020604	42	Multi
12	US 6287765 B1		USPAT	20010911	131	Metho
13	US 6162926 A		USPAT	20001219	42	Multi
14	US 5973444 A		USPAT	19991026	27	Carbo

Details | Text | Image | HTML

US006573643B1

(12) United States Patent
Kumar et al.

(10) Patent No.: US 6,573,643 B1
(45) Date of Patent: Jun. 3, 2003

(54) FIELD EMISSION LIGHT SOURCE

(75) Inventors: Nalin Kumar, Cherry Hill, NJ (US); Chenggang Xie, Phoenix, AZ (US)

(73) Assignee: SI Diamond Technology, Inc., Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 98 days.

(21) Appl. No.: 09/677,361

(22) Filed: Oct. 2, 2000

Related U.S. Application Data

(63) Continuation-in-part of application No. 08/858,544, filed on Jan. 4, 1997, now Pat. No. 6,127,773, which is a continuation of application No. [illegible], filed on Jun. 2, 1993, now abandoned, which is a continuation-in-part of application No. 07/851,701, filed on Mar. 16, 1992, now Pat. No. 5,763,997, which is a continuation-in-part of application No. 08/456,453, filed on Jun. 1, 1995, now abandoned, which is a continuation-in-part of application No. 07/993,863, filed on Dec. 23, 1998, now abandoned

(51) Int. Cl.[7] H01J 1/30
(52) U.S. Cl. ..... 313/309; 313/496; 313/346 R
(58) Field of Search ..... 313/283, 309, 313/311, 336, 351, 496, 244, 346 R, 495

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[illegible] B1 * 11/2001 [illegible] et al. 445/24

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JP [illegible] * 12/1983 ..... [illegible]

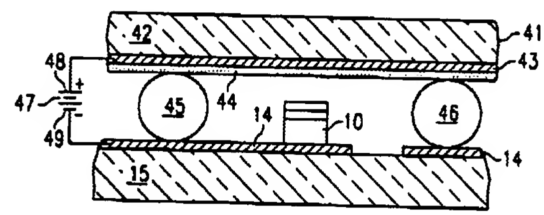
* cited by examiner

Primary Examiner—Ashok Patel
(74) Attorney, Agent, or Firm—Kelly K. Kordzik; Winstead Sechrest & Minick P.C.

(57) ABSTRACT

A field emission cathode for use in flat panel displays is described including a layer of conductive material and a layer of amorphic diamond film, functioning as a low effective work-function material, deposited over the conductive material to form emission sites. The emission sites each contain at least two sub-regions having differing electron affinities. Use of the cathode to form a computer screen is also described along with the use of the cathode to form a fluorescent light source.

24 Claims, 2 Drawing Sheets



Details | Text | Image | HTML | Full

EAST Browser - L31: (10) probe and ca | US 20020141934 | Tag: S | Doc: 5/10 | "Full" 4/13 | Total images 13|

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Summary of Invention Paragraph - BSTX (13):

[0011] A further object of the present invention is to provide a nanotube or carbon whisker having a polyhedral cross-section and having a twist along the long axis to provide even higher structural integrity and strength.

Detail Description Paragraph - DETX (16):

[0041] In addition to the myriad of uses for conventional nanotubes and carbon whiskers, the polyhedra of the present invention can also be used in a variety of uses heretofore unknown or unattainable with conventional round cross section structures. In particular, due to their size and the presence of facets, the present graphitic polyhedra provide significant improvements in nano- and micro-probes for atomic force microscopy and other work. The present invention provides a probe comprising an isolated graphitic polyhedral crystal of the present invention having a plurality of graphite sheets arranged in a plurality of layers to form an elongated structure having a long axis and a diameter and having 7 or more external facets running substantially the length of the long axis, and having protruding from one end thereof a nanotube. The microscopy probe can be used for atomic force microscopy or other forms of micro and nanoscale manipulation. The facets provide higher stability to the probe since the device that holds the probe has a flat surface onto which it can grasp, compared to a curved surface of a conventional circular cross section nanoprobe. Additionally, due to the large size of the preferred embodiments of the present graphitic polyhedral crystals, manipulation under optical microscope conditions is significantly improved, a big advantage over conventional nanoprobes.

Claims Text - CLTX (27):

27. A microscopy probe comprising a graphitic polyhedral crystal having a plurality of graphite sheets arranged in a plurality of layers to form an elongated structure having a long axis and a diameter and having 7 or more external facets running substantially the length of the long axis, and having protruding from one end thereof a nanotube.

Details Text Image HTML KWIC

	Document ID	Kind Codes	Source	Issue Date	Pages	
1	US 20030052585 A		US-PGPUB	20030320	14	Indiv
2	US 20030042922 A		US-PGPUB	20030306	8	Probe
3	US 20030031912 A		US-PGPUB	20030213	10	Fuel
4	US 20020168609 A		US-PGPUB	20021114	17	DENTA
5	US 20020141934 A		US-PGPUB	20021003	13	Graph
6	US 20020046953 A		US-PGPUB	20020425	17	Catal
7	US 20020045148 A		US-PGPUB	20020418	17	Paste
8	US 6508647 B2		USPAT	20030121	16	Paste

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Patent Application Publication Oct. 3, 2002 Sheet 3 of 5 US 2002/0141934 A1

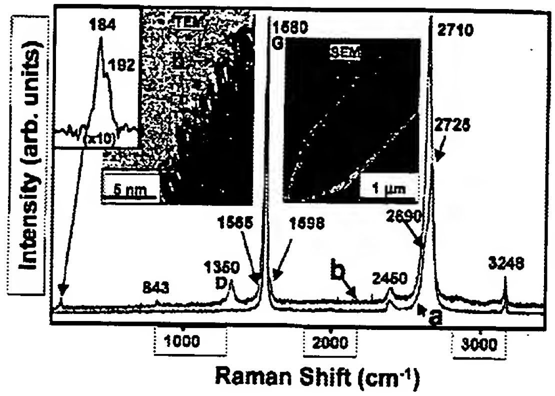

Figure 3.

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DETAILED DESCRIPTION OF THE INVENTION

[0045] The above-described previous invention can be used in one of the key steps of the present invention, to deposit metallocatalysts for carbon nanostructure growth at the tips of nanowires and/or conductive cantilevers. FIG. 4 shows a basic conductive substrate 31 having deposited thereon a tip 45 thereof a small amount (dot) 33 of catalyst and a carbon nanostructure 35 extending therefrom. The substrate 31 can be a nanowire, a cantilever, a micro/nanometer structure, a wafer, or any other suitable structure made of any material. The catalyst "dot" 33 is the necessary material for inducing the catalytic growth of a single carbon nanostructure at a predetermined location. The catalyst dot 33 can be monometallic, metallic, nonmetallic, or any material that produces desired carbon nanostructure growth.

[0046] The present invention applies generally to carbon nanotubes (including both single-wall carbon nanotubes and multi-wall carbon nanotubes) and also to carbon nanofibers, needles, whiskers, and the like. Therefore, all nanoscale carbon structures are henceforth referred to using the inclusive general term "carbon nanostructures".

[0047] The present invention can be used for production of carbon nanostructure-anchored cantilevers that can significantly improve the performance (such as resolution) of conventional scanning probe microscopy, for example, atomic force microscopy (AFM), scanning tunneling microscopy (STM), etc. The present invention can be used also in many other processes of micro and/or nanofabrication with carbon nanostructures.

[0048] Some features of the present invention are:

[0049] 1. Proper selection of metal catalyst(s), for example, Co, Ni, and Fe, and preferably programmable, pulsed electrolytic deposition of the desired specific catalysts precisely at the tips of nanowires and/or conductive cantilevers;

[0050] 2. Catalyst-induced growth of carbon nanostructures at the catalyst-deposited tips;

[0051] 3. Control of carbon nanostructure growth pattern by manipulation of

			...ue Date	Pages	
			...0320	14	Indiv
			...0306	8	Probe
			...0213	10	Fuel
			...1114	17	DENTA
			...1003	13	Graph
	US 20020046953 A	US-PGPUB	20020425	17	Catal
7	US 20020045148 A	US-PGPUB	20020418	17	Paste
8	US 6508647 B2	USPAT	20030121	16	Paste

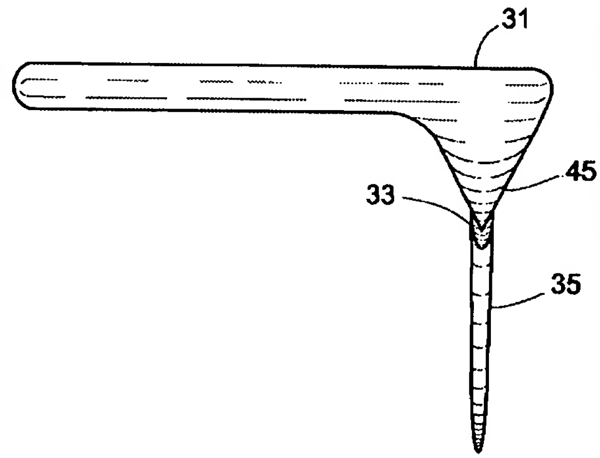

FIG. 4

EAST Browser - L35: (7) 33 and glass | US 20020158480 | Tag: S | Doc: 4/7 | Num: 13/22 | Total images: 22

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DOCUMENT-IDENTIFIER: US 20020158480 A1

TITLE: Nanotweezers and nanomanipulator

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Summary of Invention Paragraph - BSTX (6):

[0004] FIG. 16 is a side view of the tip end of a glass tube that has been worked so that a taper is formed. The diameter of this tip end is approximately 100 nm, while the diameter of the rear end of the tube not shown is 1 mm. FIG. 17 is a complete diagram of a set of nanotweezers. Two metal electrode films 84a and 84b are formed on the circumferential surface of the above-described glass tube 80 with an insulating section 82 interposed. Carbon nanotubes 86a and 86b are respectively fastened to these metal electrode films so that the carbon nanotubes protruded, thus forming a set of nanotweezers 88.

Summary of Invention Paragraph - BSTX (7):

[0005] FIG. 18 is a schematic diagram showing the application of a voltage to the nanotweezers. Lead wires 92a and 92b are led out from contact points 90a and 90b on the metal electrode films 84a and 84b and are connected to both ends of a direct-current power supply 94. When the voltage of this direct-current power supply 94 is applied, the carbon nanotube 86a is charged to a positive polarity, while the carbon nanotube 86b is charged to a negative polarity. As a result of the electrostatic attractive force of these positive and negative charges, the tip ends of the carbon nanotubes 86a and 86b close inward, so that a nano-substance 96 can be gripped between these tip ends.

Summary of Invention Paragraph - BSTX (9):

[0007] However, the nanotweezers 88 have the drawbacks. More specifically, the first drawback is that since the tip end of the glass tube 80 is finely worked to 100 nm in a tapered form, thus the nanotweezers 88 are weak and brittle in terms of strength.

Details | Text | Image | HTML | KWIC

	U	I	Document ID	Issue Date	Pages	Tit
	☐	☐	US 20020158480 A1	20021031	22	Nanotweezers and nanomanipulato
5	☐	☐	US 20020034757 A1	20020321	140	Single-molecule selection metho
6	☐	☑	US 6287765 B1	20010911	131	Methods for detecting and ident
7	☐	☑	US 6020747 A	20000201	11	Electrical contact probe

Details | Text | Image | HTML

Fig. 17

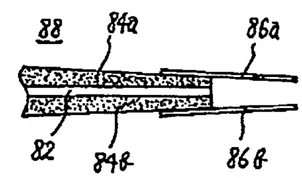
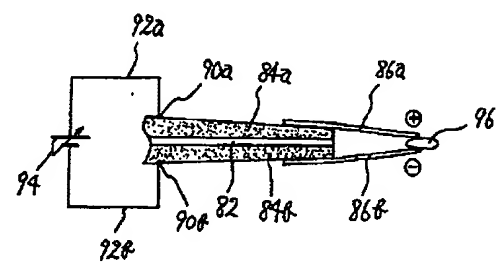


Fig. 18



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